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FROM THEORY TO PRACTICE: REFLECTIONS ON IMPLEMENTING CONSTRUCTIVIST MATHEMATICS PEDAGOGY IN A RURAL INDIAN CLASSROOM

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ABSTRACT

This reflective paper examines the practical realities of implementing constructivist pedagogy in a rural secondary school mathematics classroom in Gyalshing District, Sikkim. Drawing on five months of classroom experience as a Trained Graduate Teacher (Mathematics), the narrative integrates personal teaching observations with relevant literature and policy frameworks, including the National Education Policy (NEP) 2020. While constructivism, as conceptualised by Piaget and Vygotsky, emphasises active learning, student agency, and collaborative knowledge construction, the process of translating these principles into daily classroom practice presents unique challenges in rural Indian contexts. Key barriers encountered include foundational skill gaps among students, time and syllabus constraints, multiple non-teaching responsibilities, and socio-economic factors influencing learner motivation. Adaptive strategies combining direct instruction with micro-constructivist tasks enabled meaningful student engagement. The paper offers implications for teacher education, highlighting the need for context-sensitive pedagogical training, ongoing professional support, and flexible curriculum implementation. By documenting this lived experience, the reflection aims to bridge the gap between constructivist theory and classroom realities, contributing to discourse on sustainable pedagogical innovation in mathematics education.

KEYWORDS: Constructivism, Mathematics Education, Rural Schooling, Reflective Practice, Teacher Education, NEP 2020

1. INTRODUCTION

The views on learning of educators have been influenced by Behaviourism and constructivism, which come from two philosophical schools of thought. Behaviourism is focused on behavioural changes manipulated by conditioning of the external environment. The constructivist approach consists of cognitive and social perspectives where knowledge is personally constructed and socially influenced. Instead of only receiving information from the instructor the learners embrace their ideas, experiences and perspectives as well as those of others. It is based on the idea that knowledge can never be passed from one person to another; it is built (Koijam, 2019).

Mathematics education is more influenced by Jean Piaget and Lev Vygotsky's theory of constructivism who are considered to be major proponents in the field of constructivism (Vintere, 2018). According to Piaget's theory of cognitive development, the process of assimilation (building of schemes) and accommodation (transforming existing schemes or creating new one) will help the learners built knowledge themselves as it is not possible to provide information which will be immediately used. The cognitive structures, or the schemas are the products of continuous construction and these are the instruments which construct knowledge (Koijam, 2019). Lev Vygotsky known for his socio-cultural theory of constructivism, points out that learner develop cognitively through the process of socialization and education. Culture and social environment plays a major role in development of an individual. While Piaget and Vygotsky both believed children to be an active learner, Vygotsky considered knowledge starts at social level and only then it become individual knowledge (Koijam, 2019). In a constructive classroom teacher acts as a facilitator or a guide. According to Piaget in order to develop problem-solving skills, communication and justification are very important. Solving one's problems and questioning various strategies in mathematics can help increase interest towards the subject. Vygotsky's concept of Zone of Proximal Development and the scaffolding provided by More Knowledgeable Others can successfully handle difficult tasks that involve more complex skills and understanding.

The focus in a constructivist classroom is shifted towards the student where teacher acts as a facilitator. Teacher as facilitator should provide students with such experiences and opportunities which shall enable them to explore by predicting, hypothesising and manipulating mathematical facts. Connecting with daily life experiences and not only traditionally teaching the abstract formula by using various innovative approaches can radically change mathematics education. By using such innovative pedagogies students mathematical thinking and abstraction can progress which shall also help in permanence of knowledge (Walia, 2020). It is also stated in NEP, 2020 that connecting new experiences with the previous ones are essential to make learning meaningful. For quality mathematics education, traditional methods like rote learning and memorization should be replaced by constructive learning by relating to experience and environment (Kauts & Kaur, 2018).While constructivism has been widely endorsed in policy and teacher education discourse, its classroom implementation often encounters significant obstacles. Teachers may hold positive attitudes

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towards the approach, yet structural, contextual, and resource-related constraints frequently hinder its full realisation. In rural schools, these challenges are further compounded by infrastructural limitations, multi-grade teaching responsibilities, and socio-economic conditions affecting student preparedness.

This paper is a reflective account of my five-month journey as a secondary school mathematics teacher in a rural Sikkimese school, attempting to enact constructivist principles in daily classroom practice. The reflection builds on my Master of Education (M.Ed.) dissertation findings on teachers' attitudes towards constructivism, now revisited through the lens of lived professional experience. The purpose is to document the practical challenges and adaptations involved in sustaining constructivist pedagogy in a resource-constrained context, and to derive implications for teacher education and policy that can support more realistic, context-sensitive pedagogical reforms.

2. LITERATURE REVIEW

Constructivism, as a learning theory, has significantly shaped contemporary mathematics education discourse. Rooted in the cognitive developmental theories of Jean Piaget and the socio-cultural perspective of Lev Vygotsky, constructivism positions learners as active agents in building their own understanding. Piaget (1970) emphasised that knowledge is constructed through processes of assimilation and accommodation, while Vygotsky (1978) highlighted the centrality of social interaction, language, and the Zone of Proximal Development (ZPD) in learning. In the mathematics classroom, these ideas translate into learner-centred environments where students explore, hypothesise, and collaborate to make sense of mathematical concepts.

International studies indicate that constructivist mathematics classrooms foster deeper conceptual understanding, problem-solving skills, and positive learner attitudes (Boaler, 2002; Fosnot, 2013). In the Indian context, the National Curriculum Framework (NCF) 2005 and NEP 2020 have explicitly recommended activity-based, experiential, and contextualised learning approaches (NCERT, 2005; MHRD, 2020). However, several empirical studies reveal a persistent gap between teachers' theoretical endorsement of constructivism and its consistent application in classrooms (Kaur & Kauts, 2018). Barriers identified in the Indian setting include time-bound syllabi, examination-driven teaching, large and heterogeneous class sizes, and inadequate access to teaching-learning resources (Batra, 2005). Rural schools often face compounded challenges such as limited infrastructure, multi-grade classes, and students' varied levels of academic readiness (Govinda & Josephine, 2004). These conditions necessitate adaptive pedagogical strategies, where teachers balance constructivist ideals with pragmatic instructional adjustments.

The existing literature suggests that constructivism in India is most sustainable when adapted to local contexts through hybrid approaches combining targeted direct instruction with collaborative, inquiry-based activities (Anthony & Walshaw, 2009; Walia, 2020). Nevertheless, detailed reflective accounts from rural mathematics teachers remain scarce. This paper addresses this gap by presenting a practitioner's narrative that integrates personal experience, theory, and implications for teacher education.

3. CONTEXT AND METHODOLOGY

3.1 Context

This reflection is situated in a rural government secondary school in Gyalshing District, Sikkim. The school serves students from diverse socio-economic backgrounds, many of whom are first-generation learners. As a Trained Graduate Teacher (Mathematics), I was responsible for teaching secondary-level mathematics, primarily to Grade IX and X students, over five months. Class sizes ranged from 25 to 32 students, and instructional periods were limited to 40–45 minutes each. The school environment reflected common features of rural Indian settings, with limited access to digital technology, multi-purpose classrooms, and students with varying proficiency levels in both mathematics and the language of instruction. Many learners had minimal home-based academic support, as families often prioritised agricultural or wage labour activities over study time.

3.2 Methodology

This paper adopts a self-study reflective narrative methodology (Loughran, 2004), which is well-suited to exploring the interplay between personal pedagogical beliefs and classroom realities. Data for the reflection were drawn from daily lesson plans, observation records documenting student participation and challenges, samples of student work, and personal reflective journal entries. These sources were reviewed focusing on challenges, adaptations, and instances of successful constructivist practice. Literature was integrated both retrospectively comparing experiences with existing research and prospectively informing subsequent teaching decisions. While the analysis is grounded in personal experience, its framing within relevant theoretical and empirical work enhances its relevance to broader educational contexts.

4. FINDINGS AND REFLECTIONS

This section synthesises the major challenges encountered during the implementation of constructivist pedagogy in my rural mathematics classroom, alongside the adaptive strategies employed to sustain learner engagement. The findings align with existing literature, reinforcing that the gap between constructivist ideals and classroom realities is mediated by contextual constraints.

4.1 Foundational Skill Gaps

A persistent challenge was the disparity in students' prior mathematical knowledge. Several students in Grades IX and X demonstrated difficulties with basic concepts such as place value, multiplication tables, and operations with fractions skills that the curriculum assumes as mastered at earlier stages. This mirrors findings from rural education studies indicating that foundational skill deficits significantly hinder higher-order learning). In constructivist tasks, these gaps often disrupted lesson flow, as activities designed for exploration became remedial in nature. Adaptive strategies included targeted scaffolding, breaking complex tasks into smaller, sequential steps, and pairing stronger and weaker students for peer support,

consistent with Vygotsky's concept of the Zone of Proximal Development (Vygotsky, 1978).

4.2 Pressure of Syllabus Completion

The secondary mathematics syllabus, coupled with a tightly scheduled academic calendar, imposed significant time pressure. While NEP 2020 advocates for in-depth exploration and critical thinking, the examination-oriented structure continues to reward breadth of content over depth of understanding (MHRD, 2020). On multiple occasions, rich mathematical discussions had to be curtailed to ensure that prescribed topics were "covered" before examinations. My response involved adopting a hybrid approach introducing concepts through short, exploratory tasks, followed by focused direct instruction to meet curricular timelines.

4.3 Multiple Non-Teaching Responsibilities

In addition to teaching duties, I was responsible for organising co-curricular events, supervising assemblies, maintaining assessment records, and coordinating school activities. These responsibilities, while integral to the holistic functioning of the school, often reduced the time available for preparing rich, inquiry-based mathematics lessons. Constructivist pedagogy demands careful planning, sequencing of activities, and anticipation of student responses (Anthony & Walshaw, 2009). When preparation time was limited, I resorted to simplified activities or guided practice sessions. This echoes Batra's (2005) argument that systemic workload issues contribute to teachers' reliance on traditional methods, even when philosophically committed to student-centred learning.

4.4 Time Constraints in Class Periods

Each mathematics class period lasted approximately 40–45 minutes. Complex constructivist lessons often require extended time for exploration, group work, and consolidation. The time limitation frequently meant that consolidation was rushed, leading to incomplete conceptual development. Breaking activities into multi-period sequences was partially effective, though it occasionally disrupted lesson continuity. This tension between depth and pacing is a recurring theme in constructivist teaching literature.

4.5 Socio-Economic Barriers and Student Motivation

Many students came from households with limited formal education and faced socio-economic demands that competed with school responsibilities. For some, contributing to family income or managing household chores took precedence over academic work. Research indicates that such conditions can affect attendance, homework completion, and participation in open-ended tasks (Govinda & Josephine, 2004). Constructivist pedagogy thrives on intrinsic motivation and active engagement; fostering these qualities required deliberate efforts to connect lessons with students' lived experiences. Examples included using local measurement practices for ratio and proportion lessons, or contextualising algebra problems in agricultural scenarios familiar to students.

Overall, these findings reaffirm that sustaining constructivist pedagogy in rural mathematics classrooms requires adaptive expertise balancing ideal pedagogical models with contextually feasible modifications. As suggested by Walia (2020), hybrid strategies can preserve the learner-centred spirit of constructivism while accommodating systemic realities.

5. DISCUSSION

Living through these past five months has brought my dissertation findings to life in a way that reading transcripts and analyzing survey data never could. In my research, I found that many teachers expressed strong agreement with the principles of constructivist teaching. They valued student-centered learning, real-world problem-solving, and active engagement. On paper, the attitude was overwhelmingly positive. But the same teachers also shared that implementing these ideals in their actual classrooms was a different story.

Now, standing in their shoes, I understand why. Having a belief in constructivism is one thing; having the capacity to apply it consistently is another. The gap between attitude and practice is not about unwillingness it is shaped by layers of constraint.

On a systemic level, rigid curricula and exam-oriented structures leave little room for exploratory learning. The pressure to finish the syllabus often overrides the desire to linger on a rich problem or to let students explore multiple solution paths. Limited resources which can be whether in terms of teaching aids, technology, or even a conducive classroom layout can make the shift to active learning a slow process.

On a contextual level, students walk into the classroom with different levels of preparedness. Some have strong foundations, while others struggle with basic numeracy. In addition, socio-economic realities like the lack of home support for studies or the need to prioritize work over homework shape how much they can participate in a constructivist environment.

Finally, there is the layer of professional preparedness. Even as someone who has studied constructivism in depth during my B.Ed. and M.Ed., I find myself needing to adapt constantly simplifying activities, scaffolding more heavily, and modifying group work so that weaker students are not left behind. This kind of adaptive expertise is something that comes only with continuous training, reflection, and peer support.

The convergence of my research data, my day-to-day classroom journey, and some of the studies mentioned reinforces one clear truth: believing in constructivism is not enough. Teachers need structures, time, resources, and ongoing mentorship to make it work in real classrooms with real students.

6. POLICY AND TEACHER EDUCATION ALIGNMENT

The NEP 2020 advocates for experiential learning and competency-based curricula, explicitly calling for mathematics teaching that promotes problem-solving and critical thinking (MHRD, 2020). My experiences indicate that achieving these goals in rural contexts requires structural support beyond policy rhetoric. Time-flexible syllabi, reduced non-teaching workload, and resource provision are essential to sustain constructivist pedagogy. For teacher education, the implication is clear:

pre-service and in-service training must prepare teachers for *adaptive implementation*. This includes designing lessons that integrate local contexts, anticipating foundational skill gaps, and planning for differentiated instruction. Case-based learning in teacher training using real classroom narratives like those in this paper can better equip educators to reconcile pedagogical ideals with practical realities.

This reflection underscores that constructivism, while aspirational, must be reframed as a flexible framework rather than a rigid method. By valuing adaptation as a professional strength, teacher education can foster resilience and innovation, ensuring that pedagogical reforms like those envisioned in NEP 2020 are meaningfully realised in rural mathematics classrooms.

7. IMPLICATIONS

Three key implications are listed according to the findings of the study:

For Teachers: Adapting constructivist pedagogy to classroom realities is not a compromise but a professional necessity. Large class sizes, mixed-ability groups, exam pressure, and limited resources often make "pure" constructivism impractical. Teachers can maintain its essence by adopting hybrid approaches direct instruction for foundational concepts followed by micro-constructivist activities like group problem-solving, peer teaching, or contextual tasks. Targeted scaffolding allows teachers to support weaker learners while extending challenges to advanced students. Flexibility, reflection, and willingness to experiment help teachers preserve the learner-centered spirit of constructivism while meeting systemic demands. The goal is to *adapt without losing the core*, ensuring students remain active participants in their own learning.

For Researchers: Much Indian research on constructivist teaching focuses on attitudes rather than classroom practice. To make findings more relevant, researchers should investigate how teachers implement constructivism under diverse conditions. Case studies, classroom observations, and longitudinal tracking can reveal adaptive strategies, resource innovations, and their impact on student learning. Special attention is needed for rural, multilingual, and resource-poor contexts, where implementation challenges are unique. Shifting research questions from "Do teachers support constructivism?" to "What practical methods sustain it?" will generate actionable insights. Such research bridges the gap between philosophy and practice, offering teachers tested, context-sensitive ways to bring constructivist ideals into real classrooms.

For Teacher Educators: Teacher education programs must go beyond explaining constructivist theory to preparing teachers for contextual adaptation. Pre-service training should include lesson design for varied realities large classes, mixed abilities, and exam-oriented systems. Microteaching, peer feedback, and simulated constraints can build adaptive skills early. In-service training should facilitate sharing of field-tested strategies, co-creating adaptable lesson plans, and reflecting on successes and failures. Highlighting case studies of adaptation from diverse contexts helps teachers see flexibility as strength, not dilution. By modeling adaptive constructivism themselves, teacher educators can inspire teachers to uphold learner-centered values even when conditions are less than ideal.

8. CONCLUSION

This reflective account offers an insider's view of the journey from constructivist theory to classroom practice in a rural secondary mathematics setting in Sikkim. While the ideals of constructivism active learning, collaboration, and contextual problem-solving remained central to my teaching philosophy, their realisation required ongoing adaptation in response to systemic, contextual, and learner-specific challenges. The five-month experience affirmed that constructivism cannot be implemented as an "all-or-nothing" model in such contexts. Instead, it thrives when embraced as a flexible framework that integrates direct instruction, targeted scaffolding, and locally relevant tasks. Hybrid approaches preserved student agency while ensuring curriculum coverage, making them both pedagogically sound and pragmatically viable.

The alignment between my personal experiences and findings from earlier research suggests that these challenges are not isolated but systemic. For reforms like NEP 2020 to succeed, structural support through curriculum flexibility, reduced administrative burdens on teachers, and access to resources must accompany pedagogical training. Ultimately, constructivist practice in rural mathematics classrooms is less about perfect adherence to theory and more about maintaining its core values amid constraints. By documenting this lived reality, the paper contributes to the broader discourse on sustainable pedagogical innovation and underscores the critical role of teacher adaptability in bridging the gap between educational ideals and practice.

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